

Motorcycle Protective Gear Use Observational Survey

Final Report

Prepared for:
Office of Highway Safety Planning
4000 Collins Road
Lansing, MI

Prepared by:
Wayne State University
Transportation Research Group
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16. Abstract This study reports the results of the motorcycle protective gear observational survey conducted in the State of Michigan in 2006. Two observational surveys were conducted for this study. The first survey was concurrent with the 2006 <i>Click It or Ticket</i> safety belt observational survey conducted between April and June and included 192 observational sites. Due to the low number of motorcycle observations, a second survey was conducted which focused upon targeted locations which motorcycle had a high probability of occurrence, such as restaurants, major downtown centers and motorcycle facilities. For the targeted survey, 50 additional sites were selected for observation. All motorcycles riders and passengers were observed for protective gear use and categorized by motorcycle type, gender, age and race. The observational survey found that 99.4 percent of motorcycle riders utilize helmets, although 44.2 percent of these riders utilized half-shell helmets. In addition, the majority of the motorcycle riders were improperly protected with 74.5 percent wearing short-sleeved tops, 12 percent wearing shorts, and nearly 3 percent wearing open-toed shoes. Sixty-eight (68) percent of the riders did not wear body armor and 81 percent did not wear goggles. The high percentage of helmet use may be due to the mandatory helmet law in Michigan; however, the use of the half-shells may still be a concern.			
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1.0 INTRODUCTION

Each year motorcycle crashes claim thousands of lives, and thousands more suffer incapacitating injuries. According to the National Highway Traffic Safety Administration, 3,244 motorcyclists died and approximately 65,000 were injured in highway traffic crashes in the United States in 2002. The trend of motorcyclist fatalities, over the past decades (Figure 1), indicates that the lowest number of fatalities occurred in 1997 with just over 2,100 persons killed. From 1997 to 2002, the number of motorcyclist fatalities has continually risen to an increase of over 50 percent (1,128 more fatalities) in this five-year period.

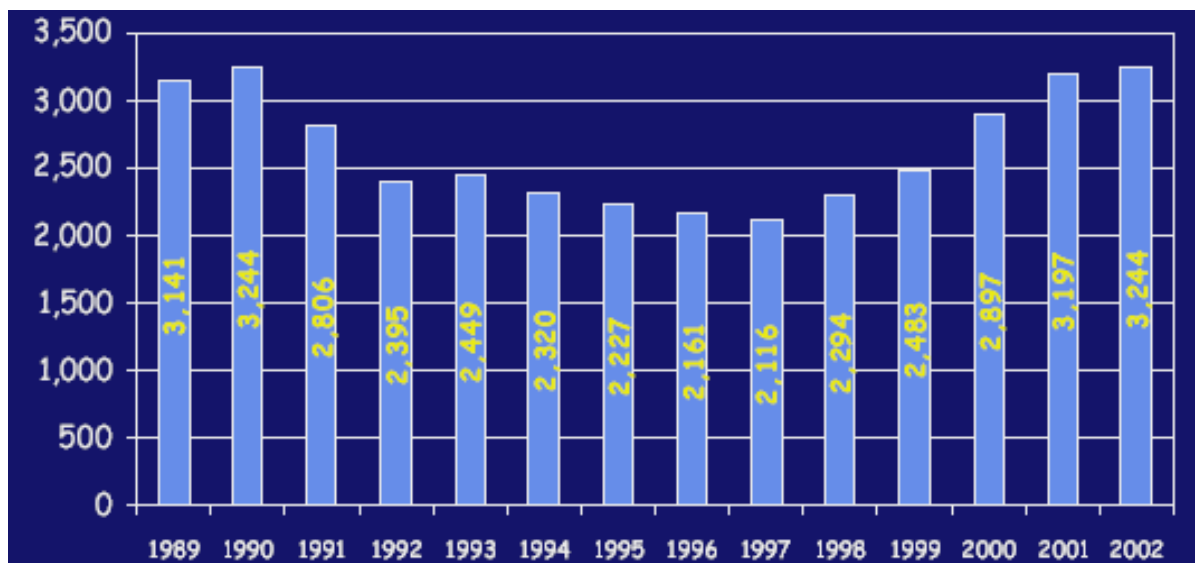


Figure 1. Trend of Motorcyclist Fatalities in the USA
[Source: NHTSA and Fatal Accident Reporting System (FARS)]

The trend of motorcycle crashes and fatalities in the State of Michigan (Figure 2) shows a slightly different trend. The lowest number of motorcyclist fatalities in Michigan occurred in 1998 with 52 fatalities, while the number of motorcycle crashes of all severities was the lowest in 1997 with 2,465 crashes. In the year 2001, in Michigan, the number of motorcyclist fatalities and the number of motorcycle-involved crashes were the highest in the ten year period from 1994 to 2003, with 94 fatalities and 3,228 crashes of all severities.

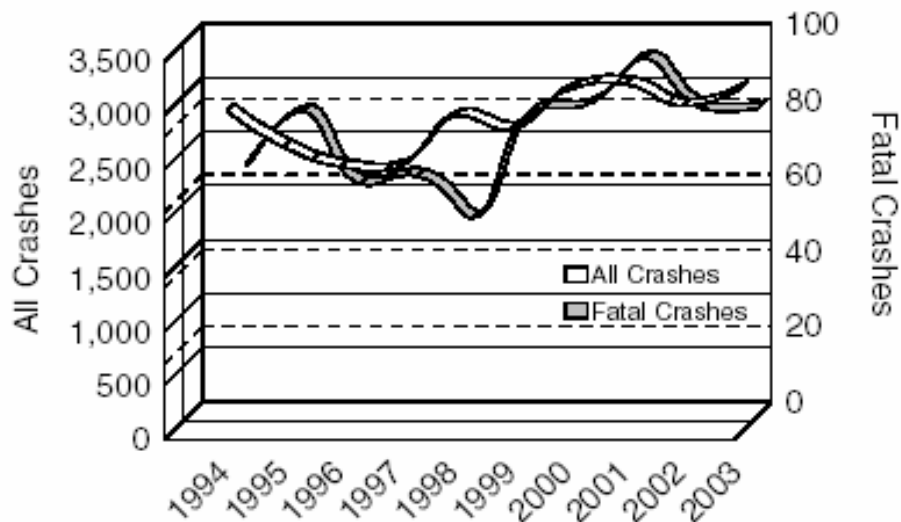


Figure 2. Trend of Motorcyclist Fatalities and All Motorcycle-Involved Crashes in Michigan
 [Source: 2003 Michigan Traffic Crash Facts, OHSP]

There are over 4 million motorcycles registered in the United States. Motorcycles have become a popular mode of transportation in recent years due to their low cost and fuel efficiency, among other factors. Motorcycle fatalities represent approximately five percent of all highway crash related fatalities each year, yet motorcycles represent just two percent of all registered vehicles in the United States. One of the main reasons motorcyclists are killed in crashes is because the motorcycle itself provides virtually no protection to the rider in a crash. Approximately 80 percent of reported motorcycle crashes result in injury or death.

Motorcycle helmet use provides the rider(s) protection from serious injuries (especially head injuries) and possible death when motorcyclists are involved in traffic crashes. Laws governing the use of helmets for all motorcycle riders are the most effective method of increasing helmet use. As of 2004, 19 states in the US, including the State of Michigan, required helmet use for all operators and passengers. In 28 states, only those under a certain age, usually 18 years and under, were required to wear helmets. Three (3) states do not have laws requiring helmet use, which are Colorado, Illinois and Iowa.

In order to assess the impact of this law, the Office of Highway Safety Planning (OHSP) funded a statewide survey in 1993 of motorcycle helmet use in Michigan. The 1993 survey was

performed in conjunction with the ‘Direct Observation of Safety Belt Use’ survey. In the 1993 survey, a total of 177 motorcycle riders were observed on 150 motorcycles. The overall helmet usage rate for drivers and passengers was reported to be 99.4 percent.

It should be noted that NHTSA does not require states to conduct motorcycle protective gear use observational surveys and thus, does not provide any approved methodologies for conducting them. NHTSA has, however, published guidelines for conducting safety belt surveys, which were followed as a part of the motorcycle protective gear use survey.

2.0 STUDY PURPOSE AND OBJECTIVES

Past observations of motorcycle helmet use in Michigan, performed in 1993, indicate a very high compliance rate (99.4 percent). In order to ensure that changes in helmet compliance have not occurred over the past 12 years, current updated usage rates were desired by the Michigan Office of Highway Safety Planning (OHSP).

The results of motorcycle protective gear use rates may assist the OHSP in developing targeted public awareness and educational programs.

The overall objective of this study was to perform an observational survey of motorcycle helmet and other protective gear use in Michigan and to report the usage rates. This survey was planned to be performed in conjunction with Safety Belt Observational Surveys. If the sample size obtained during the observational surveys was not sufficient, targeted locations based upon motorcycle registrations would be selected.

The following are the specific activities that were performed to fulfill the stated objective:

- Develop and finalize the methodology for conducting the motorcycle protective gear use observational surveys, including an adequate sample size to be representative of use rates at a statewide level.
- Retain and train observers for the survey.
- Observe and record motorcycle protective gear use along with driver/passenger demographics and other characteristics, as listed below:

- Helmet use for driver and passenger (Yes or No)
- Seating position of passenger (Rear or Side)
- Helmet type (Half-shell, Standard Open Face with Shield, Standard Open Face without Shield or Standard Full Face)
- Motorcycle type (Standard, Touring, Sport, Chopper/Custom or Scooter/Moped)
- Gender, age and ethnicity of driver and passenger
- Upper body clothing (Leather Jacket, Other Long Sleeved Top or Short Sleeved Top), lower body clothing (Leather Pants, Other Full-Length Pants or Shorts) and shoes (Above Ankle Boots, Closed-Toe Ankle Shoes or Open-Toe Ankle Shoes) for driver and passenger.
- Body armor (Gloves, Knee Pads and/or Upper Body Pads) and gloves (Yes or No) for driver and passenger.
- Goggles (Yes or No)
- Analyze and summarize the observational survey data.

3.0 METHODOLOGY

The observational surveys for motorcycle protective gear use was proposed as an extension of the Evaluation of the 2006 May *Click it or Ticket* Campaign and the annual statewide observational survey. The observational survey for motorcycle protective gear use rates was also performed at targeted locations, based upon motorcycle registrations, in order to increase the sample size of observations. There are fewer motorcycles traveling on Michigan's streets and highways as compared to vehicles. Thus, efforts were made to increase the sample size of observations, so that the use rates would not be based on a relatively small sample. Please note that the results of the 1993 helmet use survey were based on observations made for 150 motorcycles. In our opinion, in order to draw meaningful conclusions from the observations and for the results to be representative of motorcyclists throughout the State of Michigan, a much higher number of observations should be made. With larger samples, further insight into motorcycle protective gear usage in terms of driver and passenger demographics, helmet type, motorcycle type, etc. may be revealed.

Since the motorcycle protective gear use survey was conducted in conjunction with the statewide surveys, the methodology followed NHTSA's procedures as required for statewide observational surveys. As a part of last years (FY05) grant with OHSP for the "Evaluation of the 2005 May *Click it or Ticket*", the uniform criteria for conducting observational surveys, as outlined in the Code of Federal Regulations (CFR), the National Highway Traffic Safety Administration documents, and the procedures outlined in past reports of observational seat belt use surveys in Michigan were reviewed extensively. Specifically, the following criteria, as per the CFR Part 1340, were used as the basis to develop the methodology:

- The sample identified for the survey shall have a probability-based design such that estimates are representative of usage rates for the population.
- Counties, or other primary sampling units, totaling at least 85 percent of the State's population must be eligible for inclusion in the sample.
- All daylight hours for all days of the week must be eligible for inclusion in the sample. Observation sites must be randomly assigned to the selected day-of-week/time-of-day time slots.
- If observation sites are grouped to reduce data collection burdens, a random process must be used to make the first assignment, of a site within a group, to an observational time period. Thereafter, the assignment of other sites, within the group, to time periods may be made in a manner that promotes administrative efficiency and timely completion of the survey.

Specifically, the methodology for the selection of observation sites for the statewide surveys encompassing 85 percent of the state's population is described as follows:

- The 32-county sample was selected for this survey that represented 86.86 percent of the state's population, based upon 2004 U.S. Bureau of Census Data estimates, as shown in Table 1. This sample of counties also fulfills NHTSA's requirements.
- A system for partitioning the candidate counties into various strata, based upon safety belt use and vehicle miles traveled (VMT), was developed and is shown in Table 2. The number of observation sites for each stratum is also shown in Table 2. Forty-eight (48) sites were observed for Stratum 1, 50 sites for Stratum 2, 53 sites for Stratum 3 and 41 sites for Stratum 4.

Table 1. U.S. Census Bureau 2004 Census Data for Michigan by County

State of Michigan Total Population = 10,112,620

Name of County	Population	Percent of Population	Cumulative Percent Population Statewide for Michigan	County Ranking by Population	County Included in Study
Wayne County	2,016,202	19.94%	19.94%	1	Yes
Oakland County	1,213,339	12.00%	31.94%	2	Yes
Macomb County	822,660	8.13%	40.07%	3	Yes
Kent County	593,898	5.87%	45.94%	4	Yes
Genesee County	443,947	4.39%	50.33%	5	Yes
Washtenaw County	339,191	3.35%	53.69%	6	Yes
Ingham County	280,073	2.77%	56.46%	7	Yes
Ottawa County	252,351	2.50%	58.95%	8	Yes
Kalamazoo County	240,724	2.38%	61.33%	9	Yes
Saginaw County	209,062	2.07%	63.40%	10	Yes
Livingston County	177,538	1.76%	65.16%	11	Yes
Muskegon County	174,401	1.72%	66.88%	12	Yes
St. Clair County	170,916	1.69%	68.57%	13	Yes
Berrien County	163,125	1.61%	70.18%	14	Yes
Jackson County	162,973	1.61%	71.80%	15	Yes
Monroe County	152,552	1.51%	73.30%	16	Yes
Calhoun County	139,067	1.38%	74.68%	17	Yes
Allegan County	112,477	1.11%	75.79%	18	Yes
Bay County	109,480	1.08%	76.87%	19	Yes
Eaton County	107,056	1.06%	77.93%	20	Yes
Lenawee County	101,768	1.01%	78.94%	21	Yes
Lapeer County	92,510	0.91%	79.85%	22	Yes
Midland County	84,615	0.84%	80.69%	23	Yes
Grand Traverse County	82,752	0.82%	81.51%	24	Yes
Van Buren County	78,541	0.78%	82.29%	25	Yes
Shiawassee County	73,125	0.72%	83.01%	26	Yes
Clinton County	68,800	0.68%	83.69%	27	Yes
Marquette County	64,874	0.64%	84.33%	28	Yes
Isabella County	64,481	0.64%	84.97%	29	Yes
Ionia County	64,378	0.64%	85.60%	30	Yes
Montcalm County	63,627	0.63%	86.23%	31	Yes
St. Joseph County	62,964	0.62%	86.86%	32	Yes

Table 2. Vehicle Miles of Travel by Stratum

	VMT (2004) (in Thousands)	Total VMT (in Thousands)	Percent of Total VMT	Number of Sites
Stratum 1				
Ingham	2,589,095	22,048,241	25.06%	48
Kalamazoo	2,603,446			
Oakland	13,113,695			
Washtenaw	3,742,005			
Total Stratum 1 VMT				
Stratum 2				
Allegan	1,234,491	23,439,396	26.64%	50
Bay	1,325,042			
Eaton	1,189,516			
Grand Traverse	806,758			
Jackson	1,723,634			
Kent	5,773,450			
Livingston	1,954,324			
Macomb	6,527,891			
Midland	827,006			
Ottawa	2,077,284			
Total Stratum 2 VMT				
Stratum 3				
Berrien	2,180,694	23,930,076	27.20%	53
Calhoun	1,731,659			
Clinton	1,140,428			
Genesee	4,731,531			
Ionia	714,959			
Isabella	587,432			
Lapeer	892,081			
Lenawee	898,211			
Marquette	629,897			
Monroe	2,143,438			
Montcalm	589,027			
Muskegon	1,447,105			
Saginaw	2,259,369			
Shiawassee	779,541			
St. Clair	1,624,723			
St. Joseph	579,553			
Van Buren	1,000,428			
Total Stratum 3 VMT				
Stratum 4				
Wayne	18,575,126	18,575,126	21.11%	41
Total Stratum 4 VMT				
Total Strata VMT		87,992,839		

- The locations for 192 observation sites were randomly selected. The observation sites were distributed among limited access highways and major intersections. The sites were randomly chosen using a method that ensured an equal probability for each location in each stratum being selected as a candidate location. For the selection of the candidate locations, equal scale (3/8 inch = 1 mile) road maps were obtained for each county. A computerized grid was overlaid on each county map at 0.5-mile intervals in the horizontal and vertical directions. These squares represented a square area of 0.25 square miles. Each grid on the county map was assigned two numbers representing an X and Y coordinate. In addition, each grid was assigned a number by stratum. For each stratum, a random number was chosen between one and the number of grids covering the stratum. Then two additional random numbers were selected representing the X and Y coordinates of the selected grid. Random coordinates were chosen until an intersection was found located in the grid coordinates. This process was repeated until all the primary intersections were selected for the four strata. In addition, secondary intersections were selected for each primary intersection. Secondary intersections were selected within a 16 square mile area from the primary intersection site. For the selection of exit ramps, all exit ramps on limited access highways, located within the strata, were numbered sequentially. Random numbers were selected between one and the number of ramps to determine which exit ramps would be considered as candidate locations. An alternate exit ramp was also selected for each candidate location.
- Upon determination of the sites, the direction of traffic flow, day of the week and time of day at each observation site was determined through a similar random sampling method ensuring equal probability. For each intersection randomly selected, the direction of traffic flow for observation was also randomly selected. Random numbers between one and four were assigned for each primary and secondary intersection's direction of traffic movement. The selected random numbers represented one for eastbound, two for southbound, three for westbound and four for northbound. This process allowed random selection of the direction of traffic flow as well as the roadway for inclusion in the observation study.
- Each observation site was observed for motorcycles for a 50-minute time frame, while the passenger vehicle safety belt observational survey was being conducted.

- In order to minimize the travel time and distance required to conduct this study, the observation sites were clustered into geographic regions upon final selection without compromising the randomness of the data.

The observational surveys included randomly selected hours of the day for observation where each daylight hour was available for selection. The majority of motorcyclists utilize their bikes for recreational purposes, which may not occur during a typical day of the week or during a typical time of the day. In order to obtain a larger sample of motorcyclists, it was believed that targeted site selections would be required. These beliefs were substantiated during the motorcycle survey conducted with the statewide safety belt survey. The number of motorcycles observed at the sites selected for *Click It or Ticket* observational surveys did not produce a sample that was statistically significant or representative of the population. It should also be noted that rain was present during several of the observational days, which also impacted the number of motorcycles available for observation. Because of these issues, additional sites for observation were selected based upon motorcycle registration data. The methodology for the targeted selection of sites is as follows:

- The total number of registered motorcycles and mopeds, by county, were obtained from the website of the Michigan Secretary of State for all the counties in Michigan. The partitioning system utilized for the safety belt observational study was maintained for this portion of the project.
- The counties selected for the targeted observation locations total approximately 50% of registered motorcycles and mopeds in Michigan. The selected counties represent nearly 56 percent of the state's population.
- The percentages of motorcycle and moped registrants in each county were totaled by stratum and were used to select the number of additional sites that would be selected by each county and stratum. Table 3 shows the number of registered motorcycles and mopeds in the selected counties by stratum and the number of observation sites that were selected for this study. Based upon an additional 50 sites for the targeted observational surveys, it was determined that 12 sites should be selected in Stratum 1, 15 sites in Stratum 2, 15 sites in Stratum 3 and 8 sites in Stratum 4.

Table 3. Registered Motorcycles and Mopeds by Stratum

Name of County	No. of Motorcycles	No. of Mopeds	Total No. of Motorcycles and Mopeds	Percent Statewide for Michigan	No. of Sites
Stratum 1					
Ingham	4,797	431	5,228	2.19%	2
Oakland	25,231	1,754	26,985	11.3%	8
Washtenaw	6,211	603	6,814	2.85%	2
Total	36,239	2,788	39,027	16.34%	12
Stratum 2					
Livingston	5,538	247	5,785	2.42%	6
Macomb	17,164	1,335	18,499	7.75%	9
Total	22,702	1,582	24,284	10.17%	15
Stratum 3					
Genesee	9,959	686	10,645	4.46%	8
Monroe	4,751	372	5,123	2.15%	4
St. Clair	4,677	352	5,029	2.11%	3
Total	19,387	1,410	20,797	8.72%	15
Stratum 4					
Wayne	29,856	2,249	32,105	13.45%	8
Total	29,856	2,249	32,105	13.45%	8
Total Strata	108,184	8,029	116,213	48.68%	50

- In Stratum 1, 8 sites were selected in Oakland County, 2 sites were selected in Washtenaw County and 2 sites were selected in Ingham County. In Stratum 2, 9 sites were selected in Macomb County and 6 sites were selected in Livingston County. In Stratum 3, 8 sites were selected in Genesee County, 4 sites in Monroe County and 3 sites in St. Clair County.
- In order to ensure a high probability of observing motorcyclists, it was determined that the targeted locations available for random selection should be targeted to those locations that motorcyclists frequent. The types of sites included in the random selection were major intersections or intersections near restaurants, major downtown centers, motorcycle facilities, and parks and recreational areas.
- The locations of the sites for each county were randomly selected using a method that ensured equal probability for each potential site in each county to be selected as a candidate location. The sites that had a high probability of motorcycle observation were

listed by stratum and numbered. The sites were then randomly selected through random number generation by stratum.

- To further ensure a high probability of motorcycle observations, the day of the week and the time of the day selection was restricted to Fridays, Saturdays and Sundays for the day of the week and between 12 PM and 9 PM for the time of the day. Each site was assigned a two-hour time frame in which the observations were to occur. Based upon these restrictions, the day of the week and time of the day for each observation site was determined using a random sampling method ensuring equal probability of selection of the restricted days and times.
- In general, all motorcycles passing the observation sites were included in the survey. The minimum number of observations for each site was 20 motorcycles. Each observer remained at an individual observation site for a minimum of two hours in order to obtain as many motorcycle observations as possible. If an observer had not observed 20 motorcycles in two hours, they remained at the same site until 20 observations had been reached.
- A complete listing of the sites is included in Appendix I.

4.0 OBSERVER TRAINING

Several staff members from the WSU-TRG were involved in this project and the data collection. A total of six members of the WSU-TRG staff performed the field data collection efforts. Most of these observers already had experience in collecting observational surveys, as they were involved in last year's (FY05) seat belt use observational surveys. Each of these staff members has, or is pursuing, an engineering degree and has been trained in a variety of traffic data collection methods and procedures, including observational seat belt use surveys. Regardless, for this project each data collector received specific training, which was composed of technical assistance and field data collection.

The field observers were trained following a detailed written procedure using test sites around the Detroit Metropolitan area. This training was given to the data collectors prior to the target dates of actual field data collection. The trained data collectors were tested for their performance and accuracy prior to the commencement of actual surveys.

Upon completion of the training for the data collection team, each member of the team received a training manual comprised of the information received during the training session, the schedule of data collection and all necessary field supplies. The training manual included verbal descriptions supplemented by photographs of the different helmet types, motorcycle types, and other safety equipment, so that the observers had a clear understanding when recording the field data.

5.0 DATA COLLECTION

Data collection for the motorcycle observational surveys began April 18, 2006 and concluded July 23, 2006. The motorcycle observational survey was conducted concurrently with the *Click It or Ticket* statewide observational survey which began on April 18, 2006 and was completed on June 18, 2006. The data collection at the additional targeted locations for the motorcycle observational surveys occurred from July 7, 2006 through July 23, 2006.

In this data collection initiative, the drivers and passengers (if and when present) of each motorcycle were observed for helmet use and non-use. In these surveys, both the driver and passenger were separately identified based upon their gender, estimated age and race. The driver and passenger helmet use was classified as no helmet, half-shell helmet, standard open face helmet with shield, standard open face helmet without shield, or standard full face helmet. It should be noted that any half-shell exhibiting similarities to the US. Department of Transportation (USDOT) approved shell/skull type helmets were included in the half-shell category. Riders wearing shell helmets with decorative skull caps or attachments, baseball caps or other hats were considered to be not wearing any helmet and placed in the “none” category. The observers also noted other protective gear that the driver and passenger were wearing including upper body clothing, lower body clothing, shoes, body armor, and goggles. Upper body clothing was classified as no shirt, leather jacket, other long sleeved top or short sleeved top while the lower body clothing was classified as leather pants, other full-length pants or shorts. The shoes were identified as above ankle boots, closed-toe ankle shoes or open-toe ankle shoes. The body armor that was identified includes gloves, knee pads, and/or upper body pads (elbow or shoulder) and the use of goggles. The motorcycles were categorized by type into five

groups: standard, touring, sport, chopper/custom, or scooter/moped. The location of the passenger was noted as rear and/or side.

The data collected in the field was manually recorded on survey forms and returned to the office. This manual method was chosen due to concerns with computer screen visibility in sunlight or rainy conditions. The WSU-TRG believes that the manual method also increases the accuracy and data verification at the time of data entry.

In order to meet OHSP's time requirement for data submission, every field data collector sent back their field data collection forms to the office, the same day it was collected or the Monday morning following the weekend data collection. The data was then entered into the computer immediately. All necessary checks and reviews of the data were made as a part of the WSU-TRG's quality assurance/quality control program. This process assisted in providing quality data to OHSP.

6.0 DATA ANALYSIS

The data collected in the field was computerized by a team member and verified for accuracy by the project engineer and supervisor. Rates for motorcycle protective gear use were determined for each survey stratum, county, location, etc., as well as the statewide average. The SPSS software program was used to analyze and summarize the data, which allows for an unlimited number of comparisons to be made.

The statewide helmet use rate was calculated by summing up the strata helmet use rates, each multiplied by a vehicle miles of travel weighting factor for that stratum, divided by the sum of the vehicle miles of travel weighting factor. Although vehicle miles traveled is not determined for motorcycles, it can be considered representative of travel throughout the state. The resulting four vehicle miles of travel totals were compared and Stratum 3 had the highest total, 23,930,076, and was assigned a factor of 1.0. The other three strata's weighting factors were determined by dividing the vehicle miles of travel for that stratum by Stratum 3's vehicle miles of travel. Stratum 1 was assigned a weighting factor equal to 22,048,241 VMT divided by 23,930,076 VMT in Stratum 3. Stratum 2 was assigned a weighting factor equal to 23,439,396

VMT in Stratum 2 divided by 23,930,076 VMT in Stratum 3. Stratum 4 was assigned a weighting factor equal to 18,575,126 VMT in Stratum 4 divided by 23,930,076 VMT in Stratum 3. This produced a weighting factor for Stratum 1 of 0.92, for Stratum 2 of 0.98 and for Stratum 4 of 0.78. The total weighting factors equaled 3.68.

The variance for each stratum was determined by following Cochran's equation outlined in the 1977 publication "Sampling Techniques, 3rd Edition". The variance calculation is as follows:

$$\text{Variance} = \frac{n}{n-1} \sum_i \left(\frac{g_i}{\sum g_k} \right)^2 (r_i - r)^2$$

In this formula, n represents the number of observation locations, g_i is the number of observations at each location, g_k is the total number of observations within a stratum, r_i is the helmet use rate for each stratum and r is the overall helmet use rate.

The overall statewide variance was calculated in a similar manner as the overall statewide helmet use rate. The overall statewide variance was found by summing the product of each stratum's variance by the squared weighting factor and divided by the sum of the squared weighting factors.

The 95 percent confidence interval is equal to the weighted helmet use rate plus/minus 1.96 (for the Z-test at $\alpha = 0.05$) multiplied by the square root of the stratum's or statewide variance expressed as a percent. The standard error is equal to the square root of the variance. The relative error should be less than five percent according to NHTSA's passenger vehicle safety belt use guidelines and is equal to the standard error divided by the weighted statewide helmet use rate.

7.0 RESULTS AND CONCLUSION

Observational surveys for the motorcycle protective gear use were performed from April 18th through June 18th, 2006 and from July 7th through July 23rd, 2006. During these observation periods, a total of 1,944 motorcycles were observed at 104 sites. There were also 330 motorcycle passenger observations made.

The overall weighted statewide motorcycle helmet use rate is shown in Table 4. The overall weighted statewide motorcycle helmet use rate does not include the 28 rural observations in the calculation.

Table 4. Statewide Weighted Helmet Use Rate for Drivers and Front-Seat Passengers

Helmet Use Rate*	Standard Error	Relative Error
99.4% \pm 0.77%	0.39%	0.38%

** Helmet Use Rate \pm 95% Confidence Interval*

The findings for the statewide motorcycle helmet use survey for the four strata are shown in Table 5.

Table 5. Weighted Helmet Use Rate for Drivers and Passengers by Stratum

Stratum	Helmet Usage Rate*	Standard Error
Stratum 1	99.1% \pm 1.11%	0.57%
Stratum 2	97.4% \pm 0.60%	0.31%
Stratum 3	99.3% \pm 0.63%	0.32%
Stratum 4	99.7% \pm 0.58%	0.30%
Rural Only	92.9% \pm 9.93%	5.06%

** Helmet Use Rate \pm 95% Confidence Interval*

Table 6 summarizes the descriptive statistics regarding the motorcycle protective gear use observational surveys in terms of the day of the week and the time of the day.

Table 6. Motorcycle Observational Survey Descriptive Statistics

Day of the Week	No. of Sites Observed	Percent of Sites in Day of Week	Actual Total No. of Observations	Percent of Observations in Day of Week
Sunday	19	18.3%	431	22.2%
Monday	5	4.8%	20	1.0%
Tuesday	9	8.7%	19	1.0%
Wednesday	12	11.5%	16	0.8%
Thursday	11	10.6%	70	3.6%
Friday	20	19.2%	285	14.7%
Saturday	28	26.9%	1103	56.7%
Total	104	100%	1944	100%
Time of the Day	No. of Sites Observed	Percent of Sites in Time of Day	Actual Total No. of Observations	Percent of Observations in Time of Day
7 am - 9 am	3	2.9%	17	0.9%
8 am - 10 am	2	1.9%	5	0.3%
9 am - 11 am	9	8.6%	26	1.3%
10 am - 12 pm	9	8.7%	14	0.7%
11 am - 1 pm	6	5.8%	59	3.0%
12 pm - 2 pm	17	16.3%	391	20.1%
1 pm - 3 pm	11	10.6%	168	8.6%
2 pm - 4 pm	7	6.7%	112	5.8%
3 pm - 5 pm	15	14.4%	309	15.9%
4 pm - 6 pm	7	6.7%	260	13.4%
5 pm - 7 pm	1	1.0%	17	0.9%
6 pm - 8 pm	14	13.5%	454	23.3%
7 pm - 9 pm	3	2.9%	112	5.8%
Total	104	100%	1944	100%

Table 7 summarizes the types of helmets used by the drivers and passengers.

Table 7. Motorcycle Observational Survey Helmet Use

Driver Helmet Use	Actual Total # of Observations	Percent of Observations
No Helmet	17	0.8%
Half-shell Helmet	845	43.5%
Standard Open Face w/ Shield	268	13.8%
Standard Open Face w/o Shield	402	20.7%
Standard Full Face	412	21.2%
Total	1,944	100.0%
Passenger Helmet Use	Actual Total # of Observations	Percent of Observations
No Helmet	0	0.0%
Half-shell Helmet	159	48.2%
Standard Open Face w/ Shield	55	16.7%
Standard Open Face w/o Shield	79	23.9%
Standard Full Face	37	11.2%
Total	330	100.0%
Total Helmet Use	Actual Total # of Observations	Percent of Observations
No Helmet	17	0.7%
Half-shell Helmet	1,004	44.2%
Standard Open Face w/ Shield	323	14.2%
Standard Open Face w/o Shield	481	21.2%
Standard Full Face	449	19.7%
Total	2,274	100.0%

The driver and passenger helmet use rates are described in Table 8 by day of the week, and by time of the day. Note that all passengers observed were wearing a helmet. Based upon the findings of helmet use by day of the week, motorcycle users use their helmets slightly less on Tuesdays and Fridays. The number of observations for Tuesdays may have skewed the results of helmet use due to the relatively low number. Motorcycle users tend to use their helmets nearly 100 percent of the time during the peak hours of 8 am to 11 am and 4 pm to 8 pm. Early morning riders have the lowest helmet use rates of only 85.7 percent, which may be skewed due to the relatively low number of observations.

**Table 8. Driver and Passenger Helmet Use Summary by
Day of the Week and Time of the Day**

Day of the Week	No. of Driver Observations	Percent of Driver Helmet Use	No. of Passenger Observations*	Total No. of Observations	Total Percent of Helmet Use
Sunday	431	99.3%	90	521	99.4%
Monday	20	100%	5	25	100%
Tuesday	19	94.7%	3	22	95.5%
Wednesday	16	100%	1	17	100%
Thursday	70	100%	12	82	100%
Friday	285	97.5%	29	314	97.8%
Saturday	1,103	99.5%	190	1,293	99.5%
Total	1,944	99.1%	330	2,274	99.3%
Time of the Day	No. of Driver Observations	Percent of Driver Helmet Use	No. of Passenger Observations*	Total No. of Observations	Total Percent of Helmet Use
7 am - 9 am	17	82.4%	4	21	85.7%
8 am - 10 am	5	100%	0	5	100%
9 am - 11 am	26	100%	4	30	100%
10 am - 12 pm	14	85.7%	3	17	88.2%
11 am - 1 pm	59	98.3%	15	74	98.6%
12 pm - 2 pm	391	99.5%	62	453	99.6%
1 pm - 3 pm	168	100%	14	182	100%
2 pm - 4 pm	112	99.1%	18	130	99.2%
3 pm - 5 pm	309	99.0%	57	366	99.2%
4 pm - 6 pm	260	100%	40	300	100%
5 pm - 7 pm	17	100%	4	21	100%
6 pm - 8 pm	454	99.6%	93	547	99.6%
7 pm - 9 pm	112	97.3%	16	128	97.7%
Total	1,944	99.1%	330	2,274	99.3%

**100% of passengers were wearing a helmet.*

The driver and passenger helmet use rates described in Table 9 are subdivided by stratum and by county. In Table 9, the counties are listed by stratum. Because of the relatively low number of sites and/or observations in many counties, the motorcycle helmet use rates listed may not be fully representative of each county. Note that all passengers observed were wearing a helmet. Motorcycle riders in Stratum 4 tend to utilize their helmets at a higher rate than those in other strata. Jackson County in Stratum 2 has a very low helmet use rate of 50 percent, which may be skewed due to the very low number of observations.

Table 9. Driver and Passenger Helmet Use Summary by Stratum and County

Stratum 1	No. of Driver Observations	Percent of Driver Helmet Use	No. of Passenger Observations*	Total No. of Observations	Total Percent of Helmet Use
Ingham County	69	98.6%	10	79	98.7%
Oakland County	317	98.4%	45	362	98.6%
Washtenaw County	158	100%	33	191	100%
Total	544	98.9%	88	632	99.1%
Stratum 2	No. of Driver Observations	Percent of Driver Helmet Use	No. of Passenger Observations*	Total No. of Observations	Total Percent of Helmet Use
Allegan County	4	100%	0	4	100%
Bay County	9	88.9%	1	10	90%
Grand Traverse	1	100%	0	1	100%
Jackson County	2	50%	0	2	50%
Livingston County	177	99.4%	14	191	99.5%
Macomb County	376	99.7%	68	444	99.8%
Midland County	4	100%	1	5	100%
Ottawa County	4	100%	1	5	100%
Total	577	97.2%	85	662	97.4%
Stratum 3	No. of Driver Observations	Percent of Driver Helmet Use	No. of Passenger Observations*	Total No. of Observations	Total Percent of Helmet Use
Genesee County	282	99.6%	65	347	99.7%
Ionia County	1	100%	0	1	100%
Isabella County	1	100%	0	1	100%
Lapeer County	3	100%	0	3	100%
Monroe County	172	99.4%	40	212	99.5%
Montcalm County	2	100%	1	3	100%
Saginaw County	1	100%	1	2	100%
Shiawassee County	1	100%	0	1	100%
St. Clair County	30	93.3%	2	32	93.8%
St. Joseph County	3	100%	0	3	100%
Van Buren County	1	100%	0	1	100%
Total	497	99.2%	109	606	99.3%
Stratum 4	No. of Driver Observations	Percent of Driver Helmet Use	No. of Passenger Observations*	Total No. of Observations	Total Percent of Helmet Use
Wayne County	302	99.7%	44	346	99.7%
Total	302	99.7%	44	346	99.7%

**100% of passengers were wearing a helmet.*

Table 9. Driver and Passenger Helmet Use Summary by Stratum and County (continued)

Rural Only	No. of Driver Observations	Percent of Driver Helmet Use	No. of Passenger Observations*	Total No. of Observations	Total Percent of Helmet Use
Benzie County	1	100%	0	1	100%
Crawford County	2	100%	1	3	100%
Delta County	3	100%	0	3	100%
Gratiot County	4	100%	0	4	100%
Houghton County	6	100%	2	8	100%
Lake County	2	100%	0	2	100%
Leelanau County	1	0%	0	1	0%
Missaukee County	1	100%	0	1	100%
Osceola County	2	50%	1	3	66.7%
Oscoda County	1	100%	0	1	100%
Wexford County	1	100%	0	1	100%
Total	24	91.7%	4	28	92.9%

**100% of passengers were wearing a helmet.*

Based on the survey results, females tend to use their helmets nearly 1 percent more often than their male counterparts. Motorcycle riders over the age of 60 have the lowest helmet use rates. Only 15 percent, or 343 observations, of motorcycle riders utilize leather jackets and an additional 10 percent, or 231 observations, wear other long sleeved tops. This indicates that 75 percent of riders, although wearing helmets at a high rate, do not protect their upper body while riding. On the other hand, only 12 percent, or 273 observations, do not protect their lower body and wear shorts while riding. This equates to 88 percent of the riders were observed to wear some form of full-length pants. Of these riders, only 2 percent wear leather pants. The number of motorcycle riders wearing open-toe shoes is 2.5 percent, or 57 observations. The number of riders protecting their ankles with above ankle boots is greater than 47 percent, or 1,073 observations, while those wearing ankle shoes is greater than 50 percent, or 1,144 observations. Only 716 riders, or 31 percent of the observed riders, wear gloves to protect their hands. Very few riders, 3 observations, utilize additional gear to protect themselves in case of a crash. Only 422 riders, or 19 percent of motorcycle riders wear goggles. The majority (62 percent) of the motorcycles observed were of the standard type. Those riders on scooters or mopeds have the lowest helmet use rates of all riders. Tables 10 through 15 summarize helmet use by motorcycle type for the day of the week, the time of the day, gender, age, race, upper body clothing, lower body clothing, shoes, body armor, and goggle use as observed as a part of the motorcycle protective gear survey.

Table 10. All Motorcycle Types Summary

All Motorcycle Types Helmet Use		
Day of Week	Total No. of Observations	Percent of Helmet Use
Sunday	521	99.4%
Monday	25	100%
Tuesday	22	95.5%
Wednesday	17	100%
Thursday	82	100%
Friday	314	97.8%
Saturday	1,293	99.5%
Total	2,274	99.3%
Time of Day	Total No. of Observations	Percent of Helmet Use
7 am - 9 am	21	85.7%
8 am - 10 am	5	100%
9 am - 11 am	30	100%
10 am - 12 pm	17	88.2%
11 am - 1 pm	74	98.6%
12 pm - 2 pm	453	99.6%
1 pm - 3 pm	182	100%
2 pm - 4 pm	130	99.2%
3 pm - 5 pm	366	99.2%
4 pm - 6 pm	300	100%
5 pm - 7 pm	21	100%
6 pm - 8 pm	547	99.6%
7 pm - 9 pm	128	97.7%
Total	2,274	99.3%
Gender	Total No. of Observations	Percent of Helmet Use
Male	1,860	99.1%
Female	414	100%
Total	2,274	99.3%
Age	Total No. of Observations	Percent of Helmet Use
15 and under	13	100%
16-29	528	98.9%
30-59	1,689	99.4%
60+	44	97.7%
Total	2,274	99.3%
Race	Total No. of Observations	Percent of Helmet Use
Caucasian	2,232	99.3%
African American	33	97.0%
Asian or Pacific Islander	4	100%
Hispanic	5	100%
Total	2,274	99.3%

Table 10. All Motorcycle Types Summary (Continued)

Upper Body Clothing	Total No. of Observations	Percent of Helmet Use
No Shirt	5	100%
Leather Jacket	343	99.4%
Other Long Sleeved Top	231	99.6%
Short Sleeved Top	1,695	99.2%
Total	2,274	99.3%
Lower Body Clothing	Total No. of Observations	Percent of Helmet Use
Leather Pants	41	97.6%
Other Full-Length Pants	1,960	99.5%
Shorts	273	97.8%
Total	2,274	99.3%
Shoes	Total No. of Observations	Percent of Helmet Use
Above Ankle Boots	1,073	99.6%
Closed-Toe Ankle Shoes	1,144	99.0%
Open-Toe Ankle Shoes	57	96.5%
Total	2,274	99.3%
Body Armor	Total No. of Observations	Percent of Helmet Use
No Body Armor	1,547	99.2%
Gloves	716	99.4%
Knee Pads	2	100%
Upper Body Pads (Elbow or Shoulder)	2	100%
Gloves and Knee Pads	2	100%
Gloves and Upper Body Pads	2	100%
Gloves, Knee Pads, and Upper Body Pads	3	100%
Total	2,274	99.3%
Goggles	Total No. of Observations	Percent of Helmet Use
Not Worn	1,852	99.5%
Yes, Worn	422	99.1%
Total	2,274	99.3%
Motorcycle Types	Total No. of Observations	Percent of Helmet Use
Standard	1410	99.7%
Touring	417	99.8%
Sport	290	99.7%
Chopper/Custom	88	95.5%
Scooter/Moped	69	89.9%
Total	2,274	99.3%

Table 11. Standard Motorcycles Summary

Standard Motorcycles Helmet Use		
Day of Week	Total No. of Observations	Percent of Helmet Use
Sunday	364	100%
Monday	12	100%
Tuesday	18	94.4%
Wednesday	14	100%
Thursday	52	100%
Friday	138	99.3%
Saturday	812	99.8%
Total	1,410	99.7%
Time of Day	Total No. of Observations	Percent of Helmet Use
7 am – 9 am	3	66.7%
8 am – 10 am	1	100%
9 am – 11 am	15	100%
10 am – 12 pm	9	100%
11 am – 1 pm	65	100%
12 pm – 2 pm	308	99.7%
1 pm – 3 pm	102	100%
2 pm – 4 pm	74	100%
3 pm – 5 pm	236	100%
4 pm – 6 pm	175	100%
5 pm – 7 pm	16	100%
6 pm – 8 pm	337	100%
7 pm – 9 pm	69	97.1%
Total	1,410	99.7%
Gender	Total No. of Observations	Percent of Helmet Use
Male	1,114	99.6%
Female	296	100%
Total	1,410	99.7%
Age	Total No. of Observations	Percent of Helmet Use
15 and under	10	100%
16-29	200	99.5%
30-59	1180	99.8%
60+	20	95.0%
Total	1,410	99.7%
Race	Total No. of Observations	Percent of Helmet Use
Caucasian	1,395	99.7%
African American	12	100%
Asian or Pacific Islander	1	100%
Hispanic	2	100%
Total	1,410	99.7%

Table 11. Standard Motorcycles Summary (Continued)

Upper Body Clothing	Total No. of Observations	Percent of Helmet Use
No Shirt	5	100%
Leather Jacket	197	99.5%
Other Long Sleeved Top	136	99.3%
Short Sleeved Top	1,072	99.8%
Total	1,410	99.7%
Lower Body Clothing	Total No. of Observations	Percent of Helmet Use
Leather Pants	17	100%
Other Full-Length Pants	1,243	99.8%
Shorts	150	99.3%
Total	1,410	99.7%
Shoes	Total No. of Observations	Percent of Helmet Use
Above Ankle Boots	732	99.9%
Closed-Toe Ankle Shoes	647	99.5%
Open-Toe Ankle Shoes	31	100%
Total	1,410	99.7%
Body Armor	Total No. of Observations	Percent of Helmet Use
No Body Armor	1,010	99.2%
Gloves	396	99.4%
Knee Pads	0	0%
Upper Body Pads (Elbow or Shoulder)	0	0%
Gloves and Knee Pads	1	100%
Gloves and Upper Body Pads	2	100%
Gloves, Knee Pads, and Upper Body Pads	1	100%
Total	1,410	99.7%
Goggles	Total No. of Observations	Percent of Helmet Use
Not Worn	1,146	99.7%
Yes, Worn	264	99.6%
Total	1,410	99.7%

Table 12. Touring Motorcycles Summary

Touring Motorcycles Helmet Use		
Day of Week	Total No. of Observations	Percent of Helmet Use
Sunday	98	100%
Monday	13	100%
Tuesday	4	100%
Wednesday	1	100%
Thursday	17	100%
Friday	61	100%
Saturday	223	99.6%
Total	417	99.8%
Time of Day	Total No. of Observations	Percent of Helmet Use
7 am - 9 am	10	100%
8 am - 10 am	3	100%
9 am - 11 am	13	100%
10 am - 12 pm	1	100%
11 am - 1 pm	7	100%
12 pm - 2 pm	72	100%
1 pm - 3 pm	30	100%
2 pm - 4 pm	19	100%
3 pm - 5 pm	57	100%
4 pm - 6 pm	64	100%
5 pm - 7 pm	3	100%
6 pm - 8 pm	108	100%
7 pm - 9 pm	30	96.7%
Total	417	99.8%
Gender	Total No. of Observations	Percent of Helmet Use
Male	340	99.7%
Female	77	100%
Total	417	99.8%
Age	Total No. of Observations	Percent of Helmet Use
15 and under	2	100%
16-29	33	100%
30-59	360	99.7%
60+	22	100%
Total	417	99.8%
Race	Total No. of Observations	Percent of Helmet Use
Caucasian	409	99.8%
African American	6	100%
Asian or Pacific Islander	2	100%
Hispanic	0	0%
Total	417	99.8%

Table 12. Touring Motorcycles Summary (Continued)

Upper Body Clothing	Total No. of Observations	Percent of Helmet Use
No Shirt	0	0%
Leather Jacket	64	100%
Other Long Sleeved Top	41	100%
Short Sleeved Top	312	99.7%
Total	417	99.8%
Lower Body Clothing	Total No. of Observations	Percent of Helmet Use
Leather Pants	13	100%
Other Full-Length Pants	370	99.7%
Shorts	34	100%
Total	417	99.8%
Shoes	Total No. of Observations	Percent of Helmet Use
Above Ankle Boots	220	99.5%
Closed-Toe Ankle Shoes	187	100%
Open-Toe Ankle Shoes	10	100%
Total	417	99.8%
Body Armor	Total No. of Observations	Percent of Helmet Use
No Body Armor	270	99.6%
Gloves	146	100%
Knee Pads	0	0%
Upper Body Pads (Elbow or Shoulder)	0	0%
Gloves and Knee Pads	0	0%
Gloves and Upper Body Pads	0	0%
Gloves, Knee Pads, and Upper Body Pads	1	100%
Total	417	99.8%
Goggles	Total No. of Observations	Percent of Helmet Use
Not Worn	290	99.7%
Yes, Worn	127	100%
Total	417	99.8%

Table 13. Sport Motorcycles Summary

Sport Motorcycles Helmet Use		
Day of Week	Total No. of Observations	Percent of Helmet Use
Sunday	34	100%
Monday	0	0%
Tuesday	0	0%
Wednesday	2	100%
Thursday	10	100%
Friday	67	98.5%
Saturday	177	100%
Total	290	99.7%
Time of Day	Total No. of Observations	Percent of Helmet Use
7 am - 9 am	4	75.0%
8 am - 10 am	1	100%
9 am - 11 am	0	0%
10 am - 12 pm	2	100%
11 am - 1 pm	1	100%
12 pm - 2 pm	53	100%
1 pm - 3 pm	21	100%
2 pm - 4 pm	19	100%
3 pm - 5 pm	52	100%
4 pm - 6 pm	39	100%
5 pm - 7 pm	1	100%
6 pm - 8 pm	78	100%
7 pm - 9 pm	19	100%
Total	290	99.7%
Gender	Total No. of Observations	Percent of Helmet Use
Male	267	99.6%
Female	23	100%
Total	290	99.7%
Age	Total No. of Observations	Percent of Helmet Use
15 and under	0	0%
16-29	245	99.6%
30-59	45	100%
60+	0	0%
Total	290	99.7%
Race	Total No. of Observations	Percent of Helmet Use
Caucasian	278	99.6%
African American	9	100%
Asian or Pacific Islander	0	0%
Hispanic	3	100%
Total	290	99.7%

Table 13. Sport Motorcycles Summary (Continued)

Upper Body Clothing	Total No. of Observations	Percent of Helmet Use
No Shirt	0	0%
Leather Jacket	62	100%
Other Long Sleeved Top	44	100%
Short Sleeved Top	184	99.5%
Total	290	99.7%
Lower Body Clothing	Total No. of Observations	Percent of Helmet Use
Leather Pants	5	100%
Other Full-Length Pants	228	99.6%
Shorts	57	100%
Total	290	99.7%
Shoes	Total No. of Observations	Percent of Helmet Use
Above Ankle Boots	64	100%
Closed-Toe Ankle Shoes	215	99.5%
Open-Toe Ankle Shoes	11	100%
Total	290	99.7%
Body Armor	Total No. of Observations	Percent of Helmet Use
No Body Armor	161	99.4%
Gloves	124	100%
Knee Pads	1	100%
Upper Body Pads (Elbow or Shoulder)	2	100%
Gloves and Knee Pads	1	100%
Gloves and Upper Body Pads	0	0%
Gloves, Knee Pads, and Upper Body Pads	1	100%
Total	290	99.7%
Goggles	Total No. of Observations	Percent of Helmet Use
Not Worn	287	99.7%
Yes, Worn	3	100%
Total	290	99.7%

Table 14. Chopper/Custom Motorcycle Summary

Chopper/Custom Motorcycle Helmet Use		
Day of Week	Total No. of Observations	Percent of Helmet Use
Sunday	18	88.9%
Monday	0	0%
Tuesday	0	0%
Wednesday	0	0%
Thursday	2	100%
Friday	24	95.8%
Saturday	44	97.7%
Total	88	95.5%
Time of Day	Total No. of Observations	Percent of Helmet Use
7 am - 9 am	4	75.0%
8 am - 10 am	0	0%
9 am - 11 am	2	100%
10 am - 12 pm	5	60%
11 am - 1 pm	0	0%
12 pm - 2 pm	15	100%
1 pm - 3 pm	15	100%
2 pm - 4 pm	6	100%
3 pm - 5 pm	14	100%
4 pm - 6 pm	11	100%
5 pm - 7 pm	0	0%
6 pm - 8 pm	13	92.3%
7 pm - 9 pm	3	100%
Total	88	95.5%
Gender	Total No. of Observations	Percent of Helmet Use
Male	79	94.9%
Female	9	100%
Total	88	95.5%
Age	Total No. of Observations	Percent of Helmet Use
15 and under	0	0%
16-29	11	90.9%
30-59	75	96.0%
60+	2	100%
Total	88	95.5%
Race	Total No. of Observations	Percent of Helmet Use
Caucasian	87	95.4%
African American	1	100%
Asian or Pacific Islander	0	0%
Hispanic	0	0%
Total	88	95.5%

Table 14. Chopper/Custom Motorcycle Summary (Continued)

Upper Body Clothing	Total No. of Observations	Percent of Helmet Use
No Shirt	0	0%
Leather Jacket	13	92.3%
Other Long Sleeved Top	5	100%
Short Sleeved Top	70	95.7%
Total	88	95.5%
Lower Body Clothing	Total No. of Observations	Percent of Helmet Use
Leather Pants	4	75.0%
Other Full-Length Pants	78	96.2%
Shorts	6	100%
Total	88	95.5%
Shoes	Total No. of Observations	Percent of Helmet Use
Above Ankle Boots	48	95.8%
Closed-Toe Ankle Shoes	40	95.0%
Open-Toe Ankle Shoes	0	0%
Total	88	95.5%
Body Armor	Total No. of Observations	Percent of Helmet Use
No Body Armor	56	98.2%
Gloves	32	90.6%
Knee Pads	0	0%
Upper Body Pads (Elbow or Shoulder)	0	0%
Gloves and Knee Pads	0	0%
Gloves and Upper Body Pads	0	0%
Gloves, Knee Pads, and Upper Body Pads	0	0%
Total	88	95.5%
Goggles	Total No. of Observations	Percent of Helmet Use
Not Worn	66	97.0%
Yes, Worn	22	90.9%
Total	88	95.5%

Table 15. Scooter/Moped Motorcycle Summary

Scooter/Moped Motorcycle Helmet Use		
Day of Week	Total No. of Observations	Percent of Helmet Use
Sunday	7	85.7%
Monday	0	0%
Tuesday	0	0%
Wednesday	0	0%
Thursday	1	100%
Friday	24	83.3%
Saturday	37	94.6%
Total	69	89.9%
Time of Day	Total No. of Observations	Percent of Helmet Use
7 am - 9 am	0	0%
8 am - 10 am	0	0%
9 am - 11 am	0	0%
10 am - 12 pm	0	0%
11 am - 1 pm	1	0%
12 pm - 2 pm	5	80%
1 pm - 3 pm	14	100%
2 pm - 4 pm	12	91.7%
3 pm - 5 pm	7	57.1%
4 pm - 6 pm	11	100%
5 pm - 7 pm	1	100%
6 pm - 8 pm	11	90.9%
7 pm - 9 pm	7	100%
Total	69	89.9%
Gender	Total No. of Observations	Percent of Helmet Use
Male	60	88.3%
Female	9	100%
Total	69	89.9%
Age	Total No. of Observations	Percent of Helmet Use
15 and under	1	100%
16-29	39	92.3%
30-59	29	86.2%
60+	0	0%
Total	69	89.9%
Race	Total No. of Observations	Percent of Helmet Use
Caucasian	63	90.5%
African American	5	80%
Asian or Pacific Islander	1	100%
Hispanic	0	0%
Total	69	89.9%

Table 15. Scooter/Moped Motorcycle Summary (Continued)

Upper Body Clothing	Total No. of Observations	Percent of Helmet Use
No Shirt	0	0%
Leather Jacket	7	100%
Other Long Sleeved Top	5	100%
Short Sleeved Top	57	87.7%
Total	69	89.9%
Lower Body Clothing	Total No. of Observations	Percent of Helmet Use
Leather Pants	2	100%
Other Full-Length Pants	41	95.1%
Shorts	26	80.8%
Total	69	89.9%
Shoes	Total No. of Observations	Percent of Helmet Use
Above Ankle Boots	9	100%
Closed-Toe Ankle Shoes	55	90.9%
Open-Toe Ankle Shoes	5	60%
Total	69	89.9%
Body Armor	Total No. of Observations	Percent of Helmet Use
No Body Armor	50	86.0%
Gloves	18	100%
Knee Pads	1	100%
Upper Body Pads (Elbow or Shoulder)	0	0%
Gloves and Knee Pads	0	0%
Gloves and Upper Body Pads	0	0%
Gloves, Knee Pads, and Upper Body Pads	0	0%
Total	69	89.9%
Goggles	Total No. of Observations	Percent of Helmet Use
Not Worn	63	95.2%
Yes, Worn	6	83.3%
Total	69	89.9%

Overall, drivers and passengers of touring motorcycles have the highest helmet use rate of 99.8% followed by standard and sport motorcycles with 99.7% and choppers and custom motorcycles with 95.5%. The lowest helmet use rate encompasses the occupants of scooters and mopeds with 89.9% wearing helmets. In general, females have a higher usage rate than males. The lowest helmet use rate occurs on Tuesday (95.5%), early in the morning from 7:00 am to 9:00 am (85.7%). Table 16 shows the helmet use rates by different types of helmets and other protective gear.

Table 16. Motorcycle Protective Gear Use by Helmet Types

	Helmet Types									
	No Helmet		Half-shell Helmet		Standard Open Face w/Shield		Standard Open Face w/o Shield		Standard Full Face	
Upper Body Clothing	No. of Observations	% of Use	No. of Observations	% of Use	No. of Observations	% of Use	No. of Observations	% of Use	No. of Observations	% of Use
No Shirt	0	0%	4	0.2%	0	0%	1	0%	0	0%
Leather Jacket	2	0.1%	132	5.8%	78	3.4%	31	1.4%	100	4.4%
Other Long Sleeved Top	1	0%	70	3.1%	48	2.1%	41	1.8%	71	3.1%
Short Sleeved Top	14	0.6%	798	35.1%	197	8.7%	408	17.9%	278	12.2%
Total	17	0.7%	1,004	44.2%	323	14.2%	481	21.2%	449	19.7%
	No Helmet		Half-shell Helmet		Standard Open Face w/Shield		Standard Open Face w/o Shield		Standard Full Face	
	No. of Observations	% of Use	No. of Observations	% of Use	No. of Observations	% of Use	No. of Observations	% of Use	No. of Observations	% of Use
Lower Body Clothing										
Leather Pants	1	0%	15	0.7%	8	0.4%	6	0.3%	11	0.5%
Other Full-Length Pants	10	0.4%	896	39.4%	287	12.6%	415	18.2%	352	15.5%
Shorts	6	0.3%	93	4.1%	28	1.2%	60	2.6%	86	3.8%
Total	17	0.7%	1,004	44.2%	323	14.2%	481	21.2%	449	19.7%
	No Helmet		Half-shell Helmet		Standard Open Face w/Shield		Standard Open Face w/o Shield		Standard Full Face	
	No. of Observations	% of Use	No. of Observations	% of Use	No. of Observations	% of Use	No. of Observations	% of Use	No. of Observations	% of Use
Shoes										
Above Ankle Boots	4	0.2%	530	23.3%	111	4.9%	303	13.3%	125	0.5%
Closed-Toe Ankle Shoes	11	0.5%	457	20.1%	208	9.1%	162	7.1%	306	15.5%
Open-Toe Ankle Shoes	2	0.1%	17	0.7%	4	0.2%	16	0.7%	18	3.8%
Total	17	0.7%	1,004	44.2%	323	14.2%	481	21.2%	449	19.7%
	No Helmet		Half-shell Helmet		Standard Open Face w/Shield		Standard Open Face w/o Shield		Standard Full Face	
	No. of Observations	% of Use	No. of Observations	% of Use	No. of Observations	% of Use	No. of Observations	% of Use	No. of Observations	% of Use
Body Armor										
No Body Armor	13	0.6%	722	31.8%	162	7.1%	390	17.2%	260	11.4%
Gloves	4	0.2%	280	12.3%	160	7.0%	91	4.0%	181	8.0%
Knee Pads	0	0%	1	0%	0	0%	0	0%	1	0%
Upper Body Pads	0	0%	0	0%	0	0%	0	0%	2	0.1%
Gloves and Knee Pads	0	0%	1	0%	0	0%	0	0%	1	0%
Gloves and Upper Body Pads	0	0%	0	0%	1	0%	0	0%	1	0%
Gloves, Knee Pads and Upper Body Pads	0	0%	0	0%	0	0%	0	0%	3	0.1%
Total	17	0.7%	1,004	44.2%	323	14.2%	481	21.2%	449	19.7%
	No Helmet		Half-shell Helmet		Standard Open Face w/Shield		Standard Open Face w/o Shield		Standard Full Face	
	No. of Observations	% of Use	No. of Observations	% of Use	No. of Observations	% of Use	No. of Observations	% of Use	No. of Observations	% of Use
Goggles										
Not Worn	13	0.6%	836	36.8%	313	13.8%	246	10.8%	444	19.5%
Yes, Worn	4	0.2%	168	7.4%	10	0.4%	235	10.3%	5	0.2%
Total	17	0.7%	1,004	44.2%	323	14.2%	481	21.2%	449	19.7%

Overall, the plurality of drivers and passengers were wearing half-shell helmets, short sleeved tops and full length pants. Most occupants were either wearing above ankle boots or closed-toe ankle shoes. There were very few wearing open-toe ankle shoes. Most occupants wore no body armor; however, if they did, gloves had the highest percent of use.

8.0 PROGRAM ENHANCEMENTS

Future programs should focus on improving the helmet use rate in rural areas, since they have lower helmet use rates than the riders in the urban areas.

The results of the motorcycle protective gear survey show that the helmet usage rate is very high, as expected, due to the mandatory helmet law in Michigan. However, most drivers and passengers are not wearing other protective gear in order to protect their body in case of a crash. Therefore, future programs should focus on encouraging people to wear leather jackets or other long-sleeved tops and body armor including knee pads and upper body pads.

**APPENDIX I –LISTING OF THE SITES IN MICHIGAN OBSERVED
CONCURRENTLY WITH THE *CLICK IT OR TICKET* SURVEY**

STRATUM 1	
County	Intersection No. and Name
Ingham County	1. M-106 and M-52
	2. Lake Lansing and Hagadorn
	3. Barnes and Eden
	4. Michigan and Waverly
	5. Putnam and M-43
	6. M-43 and Williamston
	7. Barry and Zimmer
	8. Tihart and Cornell
	9. Holt and M-52
	10. Cavannah and Pennsylvania
	11. Rossman and Onodaga
	12. I-496 and Dunkel
	13. Cedar and US-127
	14. US-127 and Saginaw
Kalamazoo County	1. M-43 and 6 th
	2. M-89 and 43 rd
	3. H Ave. and 30 th
	4. K Drive and 4 Mile
	5. AB and M-89
	6. M-89 and 42 nd
	7. G and Riverview
	8. S Ave. and 8 th
	9. S Ave. and 34 th
	10. W Ave. and 2 nd
Oakland County	1. Taft and 9 Mile
	2. Northwestern and Middlebelt
	3. Clarkston and Baldwin
	4. Snell and Rochester
	5. 14 Mile and Main
	6. Holly and Grange Hall
	7. Grand River and Taft
	8. I-696 and Orchard Lake
	9. M-10 and 8 Mile
	10. I-696 and Woodward
	11. Walton and Lapeer
	12. Dixie and Davisburg
	13. I-75 and Sashabaw
Washtenaw County	1. Ann Arbor and East Main
	2. Saline-Milan and Mooreville
	3. Mooreville and Stony Creek
	4. Dixboro and North Territorial
	5. Austin and Schneider
	6. Geddes and Earhart
	7. Zeeb and North Territorial
	8. I-94 and Jackson
	9. I-94 and Huron/Whitaker
	10. I-94 and State
	11. M-14 and Maple

STRATUM 2	
County	Intersection No. and Name
Allegan County	1. 102 nd and 42 nd
	2. 30 th and 134 th
	3. US-131 and 135 th
	4. M-89 and US-131
Bay County	1. M-61 and Standish
	2. Garfield/Rodgers and Anderson
	3. Finn and Munger
	4. I-75 and Pinconning
Eaton County	1. M-43 and Canal
	2. Ionia and M-50
	3. Nixon and Willow
	4. Royston and Island Highway
	5. Ainger and Battle Creek
	6. I-96 and Nash
	7. Battle Creek and Kalamo
	8. Main and Washington
Grand Traverse County	1. M-72 and M-31
Jackson County	1. Rosehill and Elm
	2. Wolf Lake and Cady
	3. Michigan and Lake
	4. Michigan and US-127
	5. US-127 and Page
Kent County	1. 4 Mile and Walker
	2. Sparta and Ball Creek
	3. US-131 and 10 Mile
	4. US-131 and 84 th
	5. US-131 and 68 th
	6. 10 Mile and Wabasis
	7. Lakeview and 14 Mile
	8. 17 Mile and Myers Lake
Livingston County	1. Grand River and Pleasant Valley
	2. M-36 and Dexter
	3. M-36 and M-106
	4. I-96 and Kensington
	5. US-23 and Clyde
	6. Old US-23 and M-59
Macomb County	1. Jefferson and Martin
	2. 22 Mile and Heydenreich
	3. Moravian and Harrington
	4. 27 Mile and Romeo Plank
	5. 34 Mile and M-53
	6. 23 and M-53
	7. I-696 and Groesbeck
Midland County	1. Redstone and 11 Mile
	2. Pine River and Badour
	3. Meridian and Lake Sanford
	4. Main and Washington
	5. M-20 and Homer
Ottawa County	1. Lake Michigan and 136 th
	2. Polk and 104 th

STRATUM 3	
County	Intersection No. and Name
Berrien County	1. Pipestone and Naomi
	2. I-94 and Lakeside/Union
	3. I-94 and US-31
Calhoun County	1. 15 Mile and Michigan
	2. Evanston and Michigan
	3. B Drive and Beadle Lake
	4. I-94 and 5 Mile
Clinton County	1. M-21 and Lowell
	2. M-21 and Shepardsville
	3. Hyde and Welling
	4. Price/Main and Grange
	5. Clark and Upton
Genesee County	1. M-57 and Vassar
	2. Flushing and Ballanger
	3. Grand Blanc and Duffield
	4. Beecher and Elms
	5. Mt. Morris and I-75
	6. I-475 and Court
Ionia County	1. Zahm/Bridge and State
	2. Cross/Clarksville and Main
Isabella County	1. Blanchard and Winn
Lapeer County	1. M-24 and Coulter
	2. Otter Lake and Klam
Lenawee County	1. US-12 and Brooklyn
	2. Clinton Macon and Mills
	3. M-50 and Sand Lake

STRATUM 3 (Continued)	
County	Intersection No. and Name
Marquette County	1. Hwy. 95 and Cr-LLK
	2. Washington and Main
Monroe County	1. Ostrander and Plank
	2. Ostrander and Bunce
	3. Telegraph and Dunbar
	4. US-23 and US-223
	5. US-23 and Dixon
	6. US-23 and Plank Road
Montcalm County	1. Condensary and Crystal
	2. Sidney and Vickeryville
	3. M-91 and Sidney
Muskegon County	1. Blackmer and Heights Ravenna
	2. Ravenna Heights and Ensley
	3. Sullivan and Ravenna Heights
Saginaw County	1. Birch Run and Bishop
Shiawasee County	1. Lansing and M-52
	2. Juddville and Chipman
	3. I-69 and M-52
St. Clair County	1. Lambs Rd. and M-19
	2. Perch and M-29
	3. I-69 and Riley Center Rd.
St. Joseph County	1. Gleason and US-131
	2. Banker and Klinger
Van Buren County	1. 687 and 384
	2. CR-380 and CR-681
	3. M-51 and CR-352
	4. I-196 and Phoenix

STRATUM 4	
County	Intersection No. and Name
Wayne County	1. 6 Mile and Evergreen
	2. Telegraph and Northline
	3. Haggerty and Ecorse
	4. Wick and Wayne
	5. Eureka and Telegraph
	6. Woodward and Warren
	7. Palmer and Lilley
	8. Geddes and Canton Center
	9. Ecorse and Monroe
	10. Michigan and Greenfield
	11. Eureka and Middlebelt
	12. 7 Mile and M-53 (Van Dyke)
	13. Farmington and Plymouth
	14. Van Dyke and Davison
	15. Vernier and Mack
	16. Van Horn and Inkster
	17. Outer Drive and Rotunda/Village
	18. Annapolis and Wayne
	19. 8 Mile and Randolph
	20. Plymouth and Greenfield
	21. Goddard and Fort
	22. Grand River and 8 Mile
	23. 9 Mile and Greenfield
	24. Ford and Sheldon
	25. Vernier and Lake Shore Drive
	26. I-96 and Middlebelt
	27. I-96 and Livernois
	28. Warren and Southfield
	29. Randolph and Jefferson
	30. Greenfield and M-10
	31. Northline and I-75
	32. Schafer and Grand River
	33. I-94 and Harper/Vernier
	34. I-75 and Southfield
	35. Huron River and Sibley
	36. Rawsonville and Textile
	37. Main and Sumpter
	38. Sumpter and Oakville Waltz
	39. Waltz and Willow
	40. Savage and Haggerty/Bemis
	41. Rawsonville and Willis

RURAL STRATUM		
Area	County	Intersection No. and Name
Marquette Media Market	Schoolcraft	1. US-2 and Hwy. 77
		2. Maple St. and Arbutus Ave.
		3. I-94 and Caribou
		4. US-2 and CR-442
	Delta	5. US-2 and KK Road
		6. Hwy. 35 and Brampton 27.5
	Dickenson	7. US-2 and Hamilton Lake/State St.
		8. US-2 and Upper Pine Creek
		9. Hwy. 69 and Conrad Rd.
		10. Hwy. 69 and Groveland Mine
	Iron	11. Hwy. 69 and Camp 5 Road
		12. Logan St. and Hwy. 69
		13. 7 th Ave. and US-2 St.
		14. US-16 and US-2
		15. US-16 and Hwy. 28
	Houghton	16. Federal Forest 16/US 16 and Hwy. 38
		17. Hwy. 26 and Iroquios
		18. Hwy. 26 and Scout Camp
		19. US-41 and School
		20. US-41 and 1 st
	Keewanaw	21. US-41 and 5 th /Chassell Painesdale
		22. US-41 and Portage Entry
	Baraga	23. Hwy. 28 and W. Korpi/Saarinen
		24. US-41 and Old M-28
		25. US-41 and King Lake
	Marquette	26. US-41 and Wawanonowin
		27. US-41 and Lake Shore
		28. Hwy. 95 and CR-LLK
		29. Hwy. 95 and Beach
		30. Washington and Hwy. 28-BR
Traverse Media Market	Roscommon	1. Maple Valley and West Branch
	Oscoda	2. CR F-32 (Miller) and CR 489 (Red Oak)
	Antrim	3. Old State and Derenzy
		4. Comfort Road and Alden Hwy.
	Grand Traverse	5. M-113 and Hency
	Leelanau	6. M-22 and Carter
		7. 633 and 614
		8. Maple City Rd. and 667 and M-72
	Benzie	9. Cinder and Thompsonville
	Wexford	10. CR-38 and CR-25
	Missaukee	11. Finkle and 13 Mile
	Lake	12. 8 Mile and Bass Lake
		13. M-37 and Old M-63 (4 ½ Mile)
	Osceola	14. M-115 and 100 th

RURAL STRATUM (Continued)		
Area	County	Intersection No. and Name
Flint Media Market	Bay	1. M-61 and Standish
		2. I-75 and Pinconning
		3. Garfield/Rodgers and Anderson
		4. Finn and Munger
	Midland	5. State Rd. and North County Line
		6. Redstone and 11 Mile
		7. Pine River and Badour
		8. M-20 and Chippawa River
		9. Marsh and Flock/Lake Sanford
	Isabella	10. Millbrook and Winn
	Gratiot	11. Luce and Jefferson
	Saginaw	12. Kochville and Westervelt
		13. Birch Run and Bishop
	Shiawassee	14. I-69 and M-52
		15. Lansing and Church
		16. Lansing and M-52
Rural Control	Van Buren	1. M-51 and CR-352
		2. CR-380 and CR-681
		3. 687 and 384
		4. I-196 and Phoenix
	Allegan	5. 102 nd and 42 nd
		6. M-89 and US-131
		7. US-131 and 135 th
		8. 30 th and 134 th
	Montcalm	9. M-91 and Sidney
		10. Sidney and Vickeryville
		11. Condensary and Crystal
	Ionia	12. Zahm/Bridge and State
		13. Cross/Clarksville and Main
	Lapeer	14. M-24 and Coultier
		15. Otter Lake and Klam

**APPENDIX II –LISTING OF THE TARGETED MOTORCYCLE
OBSERVATIONAL SITES IN MICHIGAN**

Strata 1	Intersections
Ingham County	Okemos and Grand River
	Cider and Edgewood
Oakland County	Grand River and Farmington
	Huron and Saginaw
	Telegraph and Maple
	Big Beaver and Coolidge
	Main and Third
	M-59 and Elizabeth Lake Road
	Grange Hall Road and Dixie Highway
	M-24 and Burdick
	Dequindre and 12 Mile Road
	Squirrel and Walton
Washtenaw County	Huron River and Wagner
	Michigan and Ann Arbor
	Dexter and N Territorial
	Madison and Main
Strata 2	Intersections
Livingston County	Grand River and Latson
	Main and Grand River
	Silver Lake and Whitmore Lake
	Chilson and M-36
	M-36 and Main
Macomb County	S Main Street and E St. Clair Street
	Schoenherr Road and Hall Road
	Van Dyke and 18 Mile Road
	Gratiot and Main
	Washington and Green
	Groesbeck and Cass
	Gratiot and Utica
	Groesbeck Hwy and Metropolitan Pkwy
	Jefferson and 11 Mile Road

Strata 3	Intersections
Genesee County	Owen Road and Silver Parkway
	Saginaw and Grand Blanc
	Linden and Miller
	Corunna and Elms
	Main and McKinley
	Dort Highway and Bristol
	Vienna and Saginaw
	Richfield and Geneva
Monroe County	Plana and North
	Tecumseh and Cabela Blvd.
	M-59 and Monroe
	Sandy Creek and Dixie Highway
St. Clair County	River and Nook
	Lapeer and 10 th
	Main Street and Gratiot
Strata 4	Intersections
Wayne County	Fort and Southfield
	Jefferson and Connor
	Center and Main
	Main Road and Ann Arbor Road
	Ford and Canton
	Michigan Avenue and Oakwood Blvd.
	Eureka and Telegraph
	Eureka and 3 rd Avenue